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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,976	04/02/2004	Atsushi Fukui	BJS-900-495	7726
23117 7590 07/28/2009 NIXON & VANDERHYE, PC 901 NORTH GLEBE ROAD, 11TH FLOOR ARLINGTON, VA 22203				
EXAMINER				
TRINH, THANH TRUC				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
07/28/2009		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/815,976

Applicant(s)

FUKUI ET AL.

Examiner

THANH-TRUC TRINH

Art Unit

1795

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 July 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 21, 26-28 and 35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 21, 26-28 and 35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB08)
- Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/7/2009 has been entered.

Remarks

1. Claims 1-2, 21, 26-28 and 35 are pending in the application.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

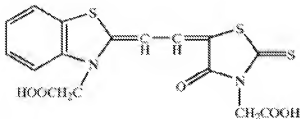
The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
2. Claims 1-2, 21, 26-28 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lupo et al. (US Patent 5885368) in view of Andriessen et al. (WO 2004/025748), and as evidenced by Gaudiana et al. (PGPub 2005/0257827)

Regarding claims 1-2, as seen in Figure 1, Lupo et al. teaches a dye-sensitized solar cell comprising a transparent conductive layer (11), a porous semiconductor of titanium oxide (12) on which a dye sensitizer is adsorbed, a carrier transport layer (14) and an counter electrode (15) which are formed in this order on a transparent substrate (16). (See col. 2 lines 30-57). Lupo et al. also teaches dye sensitizer is made of ruthenium metal complex dye such as cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylate)-ruthenium(II) (See formular VIII). Lupto et al. further teaches the semiconductor layer is subjected to a warm air treatment (See col. 26 lines 58-67 bridging col. 27 lines 1-3, or col. 27 lines 40-52). Therefore it is the Examiner's position that the absorbance peak of the porous semiconductor of Lupo et al. is located on a shorter wavelength side of the absorbance spectrum than that of the porous semiconductor layer observed immediately after the dye sensitizer is adsorbed, as indicated from Applicant's disclosure that this characteristic is a result of a thermal treatment (See Specification, page 13).

Lupo et al. does not explicitly teaches the dye sensitizer is of



or tris(isothiocyanato)-ruthenium(II)-2,2':6',2''-terpyridine-4,3',4''-tricarboxylic acid, tris-tetrabutylammonium salt.

Andriessen et al. teaches using organic dyes (SSOD) having the same ring structure as the ring structure above with varying substituents (see formula of SSOD organic dye on pages 16-17), and the anion form of black dye ruthenium 620 (tris(isothiocyanato)-ruthenium(II)-2,2':6',2''-terpyridine-4,3',4''-tricarboxylic acid – see page 18). Note that the neutral form of black dye is tris(isothiocyanato)-ruthenium(II)-2,2':6',2''-terpyridine-4,3',4''-tricarboxylic acid, tris-tetrabutylammonium salt as evidenced by Gaudiana et al. (see paragraph 0160).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Lupo et al. by using the organic dye sensitizer as taught by Andriessen et al., because Andriessen et al. teaches that these organic dyes are suitable spectrally sensitizing dyes. (See page 16 of Andriessen et al.). Organic dyes SSOD of Andriessen et al. and claimed organic dye are homologs are generally of sufficiently close structural similarity that there is a presumed expectation that such compounds possess similar properties. (See MPEP 2144.09). In such combination, it is the Examiner's position that the black dye has the absorbance peak of the porous semiconductor layer is located within the range of 580 nm \pm 35 nm. In

Art Unit: 1795

addition, the claimed limitations describing steps to treat the porous semiconductor layers such as light radiation treatment are process limitations that do not add any structural limitations to the device and thus are not given weight in the apparatus claim. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113.

Regarding claim 21, the claimed limitation describing steps to treat the porous semiconductor layers such as light radiation is a process limitation. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113.

Regarding claim 26, Andriessen et al. teaches using a black dye ruthenium 620 with the anion portion of (tris(isothiocyanato)-ruthenium(II)-2,2':6',2"-terpyridine-4,3',4"-tricarboxylic acid – see page 18). Note that the neutral form of black dye is tris(isothiocyanato)-ruthenium(II)-2,2':6',2"-terpyridine-4,3',4"-tricarboxylic acid, tris-tetrabutylammonium salt as evidenced by Gaudiana et al. (see paragraph 0160).

Regarding claim 27, Andriessen et al. teaches using organic dyes (SSOD) having the same ring structure as the ring structure above with varying substituents (see formula of SSOD organic dye on pages 16-17) which are homologs to instant claimed dye sensitizer; therefore Andriessen et al's dyes and instant claimed dye are generally of sufficiently close structural similarity that there is a presumed expectation that such compounds possess similar properties. (See MPEP 2144.09)

Regarding claims 28 and 35, the limitations describing chemical treatment carried out by immersing the porous semiconductor layer in a solution of at least 30

times as much that of the porous semiconductor layer by volume, and the time lapse for chemical treatment are process limitations that do not add any structural limitations to the device and thus are not given weight in the apparatus claim. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113.

3. Claims 1, 2, 21, 27-28 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa (PGPub 20020040728).

Regarding claims 1-2 and 27, as seen in Figure 1, Yoshikawa discloses a dye-sensitized solar cell comprising a transparent conductive layer (10), a porous semiconductor of titanium oxide (20) on which a dye sensitizer (22) is adsorbed, a carrier transport layer (30) and an counter electrode (40) which are formed in this order on a transparent substrate (50). (See paragraphs [0069] and [0074]-[0111]). Yoshikawa also teaches the dye sensitizer is made of ruthenium metal complex dye such as cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylato)-ruthenium (II). (See formula III and R-1 in paragraph [0111]), or organic methine dye (See formula M-3 in page 14). Yoshikawa further teaches the dye-sensitized semiconductor is subjected to a chemical treatment with heteroatom-containing compounds such as tetrahydrofuran, imidazole, etc., to improve the efficiency, (See paragraphs [0027]-[0067]), therefore it is the Examiner's position that the absorbance peak of the porous semiconductor of Yoshikawa is located on a shorter wavelength side of the absorbance spectrum than that of the porous semiconductor layer observed immediately after the dye sensitizer is

adsorbed, as indicated from Applicant's disclosure that this characteristic is a result of a chemical treatment (See Specification, pages 13-15). It would have been obvious to one skilled in the art to use the organic methine dye as claimed, because the organic methine dye of Yoshikawa and the claimed organic methine dye are homologs which are generally of sufficiently close structural similarity and used for the same purpose (dye sensitizer) that there is a presumed expectation that such compounds possess similar properties. In addition, the claimed limitations describing steps to treat the porous semiconductor layers such as light radiation treatment, chemical treatment carried out by immersing the porous semiconductor layer in a solution of at least 30 times as much that of the porous semiconductor layer by volume, and the time lapse for chemical treatment are process limitations that do not add any structural limitations to the device and thus are not given weight in the apparatus claim. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113.

Regarding claim 21, the claimed limitation describing steps to treat the porous semiconductor layers such as light radiation is a process limitation. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113.

Regarding claims 28 and 35, the limitations describing chemical treatment carried out by immersing the porous semiconductor layer in a solution of at least 30 times as much that of the porous semiconductor layer by volume, and the time lapse for chemical treatment are process limitations that do not add any structural limitations to

Art Unit: 1795

the device and thus are not given weight in the apparatus claim. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113.

4. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa (PGPub 20020040728) in view of Andriessen et al. (WO 2004/025748), and as evidenced by Gaudiana et al. (PGPub 2005/0257827)

Yoshikawa teaches a dye-sensitized solar cell as applied to claims 1, 2, 21, 27-28 and 35 above.

Yoshikawa discloses the general formula of ruthenium dye sensitizer, but does not specifically list out tris(isothiocyanato)-ruthenium(II)-2,2':6',2"-terpyridine-4,3',4"-tricarboxylic acid, tris-tetrabutylammonium salt.

Andriessen et al. disclose teaches using black dye (e.g. the anion form of tris(isothiocyanato)-ruthenium(II)-2,2':6',2"-terpyridine-4,3',4"-tricarboxylic acid – see page 18). Note that the neutral form of black dye is tris(isothiocyanato)-ruthenium(II)-2,2':6',2"-terpyridine-4,3',4"-tricarboxylic acid, tris-tetrabutylammonium salt as evidenced by Gaudiana et al. (see paragraph 0160).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Yoshikawa using black dye sensitizer as taught by Andriessen et al., because Andriessen et al. teaches that these organic dyes are suitable spectrally sensitizing dyes. (See page 16 of Andriessen et al.). In the such

combination, it is the Examiner's position that the black dye has the absorbance peak of the porous semiconductor layer is located within the range of $580\text{ nm} \pm 35\text{ nm}$.

Response to Arguments

Applicant's arguments with respect to claims 1-2, 21, 26-28 and 35 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that combination of references would not have expected the beneficial results achieved by the claimed product. However, Applicant's argument is not deemed to be persuasive as Applicant has provided no evidence to show the unexpected results.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to THANH-TRUC TRINH whose telephone number is (571)272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1795

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

TT
7/18/2009